be worked on better lines. No spasmodic efforts here and there to form science classes, but technical schools which led to technical colleges, on a carefully graded system, were needed. The Education Department would have to determine clearly the lines of demarcation of the various forms of education which it would support. In the United States, Germany, France, and Switzerland, public money was ungrudgingly given to technical schools, and there was no reason why in this country there should be so much hesitation. The cause of the success and progress of continental industry was due to the keen sense of competition and to the widespread conviction that all production must be placed on a scientific basis. Science there was not considered as a luxury, but as a powerful agent of economic production. The sooner we realised that our very existence as an industrial nation was threatened the better.

THE opinions expressed by Prof. Priestley Smith in a pamphlet on the "Aims and Methods of Education" (Cornish Brothers, Manchester), just received, are accepted by the majority of people who have given thought to educational systems. The ordinary middle-class parent is content to know nothing about the efficiency of the instructors in the schools to which he sends his children. Happily, the times are not without signs of the growth of a healthy interest in the subject of rational education, and we welcome every publication which will encourage its development. All of us are of much the same opinion as regards the futility of learning by rote, and the truly educational value of a kindergarten system of education for the young. A kindergarten may be described as a place where children learn by natural instead of unnatural methods, and consequently acquire more realknowledge than by any other system. But not every school that is called a kindergarten justifies the title, for in many of these schools, as in many private schools for the middle-class, qualification to teach is often a secondary matter compared with local influence. The elementary school teacher must show himself qualified to teach before he can be recognised by the Education Department, but we have not yet reached the stage of educational progress when the master of a private school must produce similar credentials. When these anomalies are destroyed we may perhaps hope for the establishment of a rational system of education, for we shall then have the men to put it into effect. Prof. Smith says many hard but true things with regard to the classical veneer which effectually covers up natural tendencies in the public school. "The follower of nature," he remarks, "in education, adopts a different system. He believes less in books, which supply information ready cut and dried, than in mental exercises carried on in class by question, discussion, and demonstration. He helps the boy to observe and compare examples, to discover likenesses and differences, and to arrive at rules and principles by inferring them for himself. He aims at *self-training*, and studies the art of promoting it. He declares that this system arouses a greater activity of interest in the boy, and makes of his mind an instrument for observation and reflection rather than a storehouse." This is the system of education we should encourage, because it is the one which will most benefit the child, the country, and the race.

SCIENTIFIC SERIALS.

Bollettino della Società Sismologica Italiana, vol. iii. N. 3.—An electric seismoscope of double sensitiveness, by G. Agamennone.—An elastic pendulum for mechanical action, by C. Guzzanti.—Notices of earthquakes recorded in Italy (February 18–March 20, 1897), by G. Agamennone, the most interesting being those of distant, but unknown, earthquakes on February 19–20 and March 2.

N. 4.—The earthquake of Kishm (Persian Gulf) of the night of January 10–11, 1897, by G. Agamennone. A correlation of some records of a previously unknown earthquake obtained at European observatories between 9.15 and 9.32 p.m. (Greenwich mean time) on January 10, with an earthquake occurring at 9.30 (?) in the island of Kishm, but the times are too discordant to enable the velocity to be determined.—Summary of the principal eruptive phenomena in Sicily and the adjacent islands during the half-year January-June 1897, by S. Arcidiacono.—Condition of the central crater of Etna from the second half-year of 1895 to the first half-year of 1897, by A. Riccò.—Notices of the earthquakes recorded in Italy (March 20–April 27, 1897), by G. Agamennone, the most important being the Umbrian earthquake of March 21–22, the Roman earthquakes of April 3, the Lucano earthquake of April 16, and the Abruzzi earthquake of April 26–27.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, November 25.—"On the Geometrical Treatment of the 'Normal Curve' of Statistics, with especial Reference to Correlation and to the Theory of Error." By W. F. Sheppard, LL.M., formerly Fellow of Trinity College, Cambridge.

The object of the paper was, in the first place, to simplify and extend the treatment of normal correlation as expounded by Francis Galton and Karl Pearson; and in the second place to obtain general formulæ in the theory of error, and to apply them to questions which arise in relation to normal distributions and normal correlation. The method was, throughout, elementary, the use of the differential and integral calculus being avoided, though geometrical infinitesimals were to a certain extent employed.

Physical Society, November 26.—Mr. Shelford Bidwell, President, in the chair.—Mr. Rollo Appleyard read a paper on the failure of German-silver and platinoid wires. The mechanical defectiveness, and the consequent electrical instability of alloys used for electrical wires, may be discussed from two points of view: (1) as to the constitution and metallurgy of the alloy; (2) with regard to the subsequent treatment and environment of the wire. In stating the case, the author gives instances of the failure of German-silver and platinoid wire that have occurred among several thousands of resistance-coils distributed over widely different latitudes. In periods of time, varying from six weeks to several years after manufacture, the wire on some of the bobbins became brittle and broke, not only on the outer layers, but also within the coils. The towns where the faults appeared are all within the tropics, and included nearly within the isotherm of 25° C. Other coils, of nominally the same material, manufacture, and environment, have retained their original good condition. It follows that metallurgical differences exist between different samples of the same nominal quality of alloy. Examples are given to prove that failure sometimes occurs with platinoid through which no electricity has passed. Provided that the wire is good, the effect of environment is almost insignificant, *i.e.* the question is one of metallurgy, rather than of instrument-making. The author introduces a distinction in regard to brittleness. He discriminates between "primary" and "secondary" brittleness. "Primary" brittleness is characteristic of certain alloys (for instance, of gold-lead, or of gold-bismuth) from the moment of their solidification. But the brittleness of German-silver and of platinoid is of a different order; it is a subsequent phenomenon. "Primary" brittleness is thus an accident of birth, and "secondary" brittleness is a disease that develops with age and circumstance. The fracture of bad specimens of German-silver and platinoid shows patches of dark metal, crevices, and fissures. It may be supposed that, during the process of cooling, "liquation" occurs—the metals that first solidify, rejecting yet molten portions, as ice rejects foreign matter. Consequently, the strength of the final alloy varies from point to point of its mass, and in passing afterwards through the die, the weaker portions give way, and the general structure is loosened: moisture can then intrude through the capillary channels. At all fissures and crevices the electric current produces undue heating; this accounts for the failure of resistance-coils on arc-light and other circuits. As regards the protection of coils against moisture, paraffin-wax is of no use whatever; it is highly absorbent. Shellac varnish is greatly to be preferred. Ebonite does not seem to have any deteriorating effect, but it may be well to keep the alloys out of actual contact with it. In conclusion, Mr. Appleyard expressed a hope that British metallurgists would give electrical alloys special consideration. Already, British cable-manufacturers are importing thousands of tons, annually, of sheathing-wire from Germany; this is sufficiently to be regretted; he had good reason to know that instrument-makers were beginning to get the wire for their resistance-coils also from Germany. He had not enough experience of manganin to say whether that material would stand rough service in the tropics. Prof. Ayrton said the paper had raised the extremely interesting question of the permanency of metals used for resistance-coils. Some time ago he had immersed bare platinoid wires in running water in metal tanks, and the wires all broke into short pieces. He thought, at the time, this might be due to electrolysis. On another occasion he had found that by raising the temperature of platinoid to a dull-red heat in the air, by an electric current, any acquired faults in the wire were corrected, and the original resistance and flexibility were restored. Even when such metals are in good condition, the resistance temperature curve does not return upon itself; it encloses a loop, indicating two distinct values for resistance at each temperature. He had been told by Dr. Muirhead that coils intended for hot climates should be enclosed in air-tight metal cases. English manufacturers were still dubious in regard to manganin. In 1892 he had twenty coils of this material, each of a thousand ohms; the wire was silk covered. There were 2000 volts between the terminals. Their resistance had certainly not changed by 1 in 1000, although there was some amount of vagueness regarding the fifth figure, which might be due to molecular alteration, for they were heated more than was good for resistance coils. He confessed that this manganin had come from Germany. Dr. S. P. Thompson mentioned an alloy that was proposed in Germany under the name of "Constantin." He would like to know whether any information could be obtained as to the employment of cast-iron wire. It was a metal that in some respects commended itself. He had observed the failure of some German-silver coils, but he had generally attributed it to rough handling. Mr. W. Watson referred to the recent work done at the Reichsanstalt with regard to German-silver and platinoid. It was there found that all alloys containing zinc were liable to erratic change of resistance, and were unsuitable for standard coils. Moreover, even the slight amount of zinc introduced into manganin during soldering with soft solder robbed that alloy of its constancy. Silver solder, containing 75 per cent. of silver, should be employed for manganin. If Prof. Ayrton's coils were soldered with soft solder, that was sufficient to account for the change in the fifth figure. Shellac varnish was undoubtedly the best protection for coils. Absolute alcohol should be used as the solvent, and the coils should afterwards be heated for some hours at 140° C. If a heating-current was passed through German-silver or platinoid coils immersed in water, the general result was to produce brittleness.—Mr. Watson then described a thermostat which he had contrived for drying the coils after applying the shellac varnish. A hot-air oven contains a thermometer with a platinum contact at the 140° mark, and an 8 candle-power lamp. The thermometer is in circuit with a relay actuating a mercury-key for the 8 candle-power lamp. The key consists of two mercury-cups, and a corresponding U-piece of copper, inverted, one limb to each cup. It is important to keep the heating-circuit always made; for this purpose a 32 candle-power lamp is permanently connected between the two cups.—Prof. Perry then read a note on a question in thermo-dynamics, arising from correspondence that had taken place between himself, Prof. Ramsay, and Mr. Rose-Innes, with regard to a paper in the *Roy. Soc. Trans.* Mr. Rose-Innes replied.—The President proposed a vote of thanks to the authors, and the meeting adjourned until December 10.

Mathematical Society, November 11.—Prof. Elliott, F.R.S., President, in the chair.—The President briefly referred to the recent decease of Lieut.-Colonel J. R. Campbell, who had served on the Council, and rendered signal service to the Society by his liberal gift of 500*l.* to its funds.—The Treasurer gave an abstract of his report, and, in the course of his remarks, pointed out that the publications of the Society had of recent years grown to such an extent as to tax its utmost resources, and that, were it not for the help of the funds munificently established many years ago by Lord Rayleigh, and more recently by the late Lieut.-Colonel Campbell, the Society would be compelled to materially restrict its sphere of activity.—The ballot having been taken, the President announced that the gentlemen whose names were given in NATURE (October 21) had been duly elected to serve on the Council for the ensuing session.—The following communications were made: On an extension of the exponential theorem, by J. E. Campbell; the integral $\int \mathrm{P}_n^2 dx$, and allied forms in Legendre's functions, between arbitrary limits, by R. Hargreaves; on the Poncelet polygons of a Limacon, by Prof. F. Morley; the calculus of equivalent statements (No. 7), by H. MacColl; the character of the general integral of partial differential equations, by Prof. Forsyth; note on Bessel functions, by H. M. Macdonald.

Geological Society, November 17.—Dr. Henry Hicks, F.R.S., President, in the chair.—The geology of Rotuma, by J. Stanley Gardiner. The author described the relationship of the island of Rotuma (situated in lat. 12° 30′ S., long. 177° 1′ E.) to the adjoining isles. It is almost separated into two parts, which are united by a narrow neck of sand. The interior is composed of volcanoes, which have emitted lavas and fragmental rocks. Around the volcanic rocks are stratified deposits composed of sea-sand with volcanic fragments. These are partly denuded, and are mantled round by coral-reef and beach sand-flats. A remarkable cavern in the lava of Sol Mapii, with lava-stalactites, was described; there is a similar cavern in Au Huf Huf. An account of the prevalent meteorological conditions was also given. In an appendix by Mr. H. Woods, some of the rocks were described. They consist of olivine-dolerites and basalts and associated fragmental rocks.—A geological survey of the Witwatersrand and other districts in the Southern Transvaal, by Dr. Frederick H. Hatch. After giving an account of the physical characters of the area, the author proceeded to describe the various rocks, referred to (1) the Karoo system; (2) the Cape system; (3) the Primary or Archæan system. The Archæan rocks protrude in a few places through the sedimentary beds, which form the greater part of the area, and consist of an igneous complex of rocks of varied composition. The Cape system is capable of division into five distinct series:—

UPPER BEDS.	Magaliesberg and Gatsrand series; alternating quartzites, shales, and lava-flows. 16,000 to 20,000 feet.
	Dolomite and cherts, thickly bedded. 6000 to 8000 feet.
	Black reef; a bed of quartzite and conglomerate, 20 to 50 feet, and Klipriversberg amygdaloid; a basic volcanic rock, 5000 to 6000 feet.
LOWER BEDS.	Witwatersrand beds; sandstones and conglomerate (in part auriferous). 11,000 to 15,000 feet.
	Hospital Hill series; quartzites and ferruginous shales. 8000 to 10,000 feet.

The Karoo formation is represented by the coal-measures of Vereeniging and the district south of Heidelberg, and by the measures of other coal-areas. They have furnished plants which Mr. Seward refers to in a note as being of Permo-Carboniferous age. The age of the Cape system is doubtful. The Upper beds rest unconformably on the Lower ones, and if the latter be of Devonian age, as has been inferred, the former may represent the Lower Carboniferous rocks. In the discussion which followed the reading of the paper, the President asked whether there was any fossil evidence to show the age of the beds under those of Permo-Carboniferous age. The unconformities were important, and might indicate that there were rocks in the area older than those of Palæozoic age. Would it not be better to avoid using the term "Primary" for crystalline rocks suggested to be of "Archæan" age? Mr. C. Dawson pointed out the great lithological resemblance of the specimens on the table from the Hospital Hill series to some of the fluviatile rocks of the English Wealden group; particularly to the lower beds of the Hastings sands and Ashburnham group. The Cape series, of course, was a much older formation and had suffered change, but the rocks of the Hospital Hill series appeared to have suffered least. Prof. Le Neve Foster said that he considered that all persons interested in gold-mining were much indebted to the author for his very valuable contribution to our knowledge of the geology of a great gold-bearing region. He desired information upon two points: (1) whether the conglomerate-beds on the southern side of the synclinal are as rich in gold as those which have been so largely worked on the north side; and (2) what surface-indications guide the prospector in searching for the outcrop of the beds. Is their existence indicated by quartz-pebbles on the surface, or by ferruginous outcrops, or what? In conclusion, he complained of the use by the author of the expression "mineralisation of the conglomerate"; he wished in season and out of season to protest against this use of the word "mineralisation" Mr. W. H. Merritt said that what he thought of special interest was the mode of occurrence of the gold in these conglomerates. He said that this showed that auriferous solutions may occur in a very unexpected manner, and in very unexpected places; and in confirmation of this he alluded to a locality in British Columbia where gold occurred, and was worked in deposits of cupriferous pyrrhotite containing virtually no free quartz and occurring chiefly in gabbro. The Rev. J. F. Blake and Dr. J. W. Gregory also spoke. The author, replying to the President, admitted that in describing the ancient crystalline rocks he had used the term "Primary" indiscriminately with "Archæan." He agreed that it would perhaps be better to discard the former, and to use the latter term in preference. With regard to the age of the Cape formation, he had pointed out in the paper that the Witwatersrand beds were probably correctly correlated with the Table Mountain sandstone, and that the latter was underlain by the Bokkeveld shales, in which characteristic Palæozoic (Devonian) fossils had been found. Replying to Prof. Le Neve Foster, he instanced the Nigel Mine as one that had been opened up in payable ore on the south side of the synclinal. There was nothing to indicate which of the conglomerate-beds might carry gold, short of taking samples for panning or assay. He saw no objection to the use of the word "mineralisation" to indicate a secondary impregnation with mineral matter. He was glad to find that Dr. Gregory confirmed him in the idea that the Dwyka conglomerate was a volcanic breccia, and consequently indicative of volcanic activity. —Observations on the genus *Aclisina*, de Koninck, with descriptions of British species, and of some other carboniferous gastropoda, by Miss J. Donald, of Carlisle. The author made some preliminary observations on the genus *Aclisina*, and considered it advisable to regard *A. pulchra* as the type of the genus, while the so-called *A. striatula* must be placed among the *Murchsoniæ*, and *A. nana* is placed in a new genus.

Entomological Society, November 17.—Mr. R. McLachlan, F.R.S., Vice-President and Treasurer, in the chair.—Mr. Selwyn Image exhibited male examples of *Pieris brassicæ*, with a black spot on the disc of the forewings. They were bred from larvæ found on *Tropæolum* at Lee, N. Devon, and six out of ten males showed this variation. He also showed a dark aberration of *Vanessa urticæ*, taken at Copthorne in Sussex, and two fine specimens of *Plusia moneta* taken at Valerian, near Balcombe, Sussex.—Mr. M. Burr exhibited three new species of Rumanian Orthoptera in illustration of a later communication.—On behalf of Mr. T. D. A. Cockerell, of Mesilla, New Mexico, two specimens of *Synchloe lacinia* from that locality were exhibited to show the remarkable forms of variation found in individuals occurring at the same time and place and on the same flowers.—Mrs. Nicholl communicated a paper on the butterflies of Aragon, and Mr. Burr a list of Rumanian Orthoptera.—Mr. Tutt read a paper entitled "Some results of recent experiments in hybridising *Tephrosia bistortata* and *Tephrosia crepuscularia*."

Royal Meteorological Society, November 17.—Mr. E. Mawley, President, in the chair.—Mr. R. H. Curtis gave the results of a comparison between the sunshine records obtained simultaneously from a Campbell-Stokes burning recorder and from a Jordan photographic recorder. The Campbell-Stokes recorder consists of a sphere of glass, four inches in diameter, supported in a metal zodiacal frame. A card being inserted in one of the grooves according to the season of the year, the sun when shining burns away or chars the surface at the points on which its image successively falls, and so gives a record of the duration of bright sunshine. The Jordan recorder consists of a cylindrical box, on the inside of which is placed a sheet of sensitive cyanotype paper. The sunlight, which is admitted into the box by two small apertures, acts on the paper, and travelling over it by reason of the earth's rotation, leaves a distinct trace of chemical action. In an improved pattern two semi-cylindrical boxes are used, one to contain the morning, and the other the afternoon record. The Campbell-Stokes instrument gives a record of sun heat and the Jordan instrument a record of sun light; and whilst it is probably true that, as a rule, the burning and chemical effects vary directly with the brightness of the sun's rays, yet it by no means follows that the conditions which will produce the most active chemical action must necessarily and always be those most favourable for burning. It has been the opinion of most observers that the photographic instruments yield a larger record than those of the burning type. In order to set the matter at rest the Council of the Royal Meteorological Society determined to institute a comparison between the Campbell-Stokes and the Jordan recorders, which should thoroughly test the capabilities of the two instruments, and at the same time afford trustworthy data for determining how far the records yielded by the one may be accepted for comparison with those obtained from the other. These simultaneous observations were carried out by Mr. E. T. Dowson, at Geldeston, near Beccles, and extended over a period of twelve months. The records were sent to Mr. Curtis for tabulation, who gave the results of his examination in this paper. After describing the methods adopted for the measurement of the records, Mr. Curtis drew the following conclusions from the figures: (1) In the case of the Campbell-Stokes instrument the records are capable of being measured with a very fair degree of accuracy. (2) The records of the Jordan instrument afford room for much greater difference of opinion as to what ought to be tabulated, and consequently measurements of the Jordan curves are open to considerably more doubt than are measurements of the Campbell-Stokes curves. (3) When the whole of the photographic trace which can be distinctly seen, but including portions of it which are decidedly faint, has been carefully measured, the amount will approximate sufficiently to that of the Campbell-Stokes instrument to allow of records obtained from both forms of instrument being compared *inter se*. From an examination of the records at other stations it appears that on some occasions the instruments have begun to record within thirteen minutes after sunrise, and has continued up to ten minutes before sunset. Mr. Curtis concluded his paper by calling attention to various defects in the adjustment and working of the instruments, and pointed out how these might be overcome. After the paper had been read, an interesting discussion ensued as to the merits of the respective sunshine recorders.

Linnean Society, November 18.—Dr. A. Günther, F.R.S., President, in the chair—The President announced that since the close of last session they had been so fortunate as to receive from Prof. G. J. Allman, a former President of the Society, a portrait of himself painted by Miss Busk, whose portrait of her late father was now hanging near it. It was an excellent likeness, and he was sure it would be highly valued. He moved that a vote of thanks be recorded for the presentation, and this was unanimously agreed to.—Mr. Alan F. Crossman exhibited photographs of a fasciated lily (*Lilium auratum*), on which some information was given by Mr. A. D. Michael.—Mr. R. Morton Middleton exhibited and made remarks on some ants received from Ephesus. These had been referred to in a previous communication as being made use of in Asia Minor for the purpose of holding together the edges of incised wounds by means of their strongly-hooked and sharp mandibles (*Journ. Linn. Soc.*, *Zool.* vol. xxv. p. 405). The species was now identified as *Cataglyphus viatica*, Fabr. Mr. Thomas Christy gave some additional information resulting from inquiries he had made of foreign correspondents.—Mr. J. E. Harting exhibited a specimen of the great black woodpecker (*Picus martius*), lately received from Colonel W. C. Dawson, of Weston Hall, Otley, Yorkshire, where it had been shot in his presence by a friend on September 8. It was shown that this could not be the bird which had recently been lost from the Zoological Gardens, since the latter did not escape until October 9. Allusion was made to the numerous records of the occurrence of this species in England, some of which at least seemed worthy of credence, since the recorded specimens had been obtained, and were preserved in the possession of trustworthy persons. Mr. Howard Saunders expressed the opinion that there was no sufficient ground for including *Picus martius* in the list of British birds, as from its partiality for pine forests and its stationary habits, it was not likely to be a voluntary visitor to this country. The President remarked that the perfect state of plumage of the specimen exhibited was satisfactory evidence of its not having recently escaped from captivity; and that the late Lord Lilford, the year before his death (which occurred on June 17, 1896), had two black woodpeckers in his aviary in Northamptonshire, and in consequence of their ailing in health, had given them their liberty. It seemed possible that one of these might be the bird lately shot in Yorkshire.—Mr. J. E. Harting also exhibited in the flesh a hybrid pheasant and black grouse, which had been received that day from Shropshire. In appearance it precisely resembled a similar hybrid of which a coloured figure is given in early editions of White's "Selborne."—On behalf of Mr. Leonard Lush, of Stonehouse, Gloucestershire, three white partridges (*Perdix cinerea*) were exhibited, which had been shot by him on the Berwyn Mountains in Wales early in October last. It was remarkable that in the covey, which consisted of nine birds, no less than five of them were white, four only being of the normal colour.—Mr. Hamilton Leigh exhibited the skull of a red deer recently shot by him in Scotland, in which there was a singular distortion of the pedicel, resulting from an ancient fracture of the left temporal bone.—A paper by Prof. A. Dendy, of Canterbury College, N.Z., was read, on *Pontobolbos Manaarensis* (gen. et. spec. nov.), a problematical cushion-shaped marine object, measuring from 13 to 36 mm. in transverse diameter, found attached to rocks in shallow water in the Gulf of Manaar, of which he had received fifteen specimens among a collection of sponges sent to him by Mr. Edgar Thurston, Superintendent of the Madras Museum. The object was found to be concentrically laminated and to contain calcareous material, and a "ground-substance," the various microchemical reactions of which were carefully described, and which, if protoplasmic, yielded no traces of nuclear structures. Minute algæ were also detected, and in the deeper layers foreign particles in the form of sand-grains. The predominant component was found to be a dense feltwork of minute filaments, for the most part radially arranged and destitute of contents, which after prolonged study the author had come to regard as bacterial. Comparison was instituted between these filaments and certain Schizophyta, and between the entire object and certain calcareous algoid "pebbles," described by Murray, from Michigan and elsewhere, as also between it and the gigantic Rhizopod *Loftusia* (Carp. and Brady); and as an admittedly tentative conclusion, the author, anxious to record the existence of so remarkable an object, inclined to the belief that it may be a symbiote involving some gigantic rhizopod undetermined and a bacterial organism. Prof. Howes, in reading the paper, submitted some microscopic sections of the object which had been made at South Kensington from material sent him by the author. He pointed out that spicules apparently of sponges could be detected among the foreign particles; and remarked that to him and his colleagues at the Royal College of Science it appeared that while bacteria were present, algal filaments were overwhelmingly predominant, and that the evidence for the supposed presence of a gigantic rhizopod was exceedingly slender. In this criticism he was supported by Mr. George Murray, who had also examined the material, and who, after considering the comparison with the afore-mentioned "pebbles," put forward a suggestion of probable similarity to the algal "pseudomorphs" apparently parasitic on sponges, first recorded by Carter in the *Annals and Mag. Nat. Hist.* for 1878.—Mr. F. Chapman read a paper on *Haddonia*, a new genus of Foraminifera, from Torres Straits. He explained, with the aid of lantern-slides, that *Haddonia* is a calcareo-arenaceous type, of the subfamily *Lituolinæ* (of Brady).

CAMBRIDGE.

Philosophical Society, November 22.—Demonstration of the influence of uranium rays upon the formation of clouds, by Mr. C. T. R. Wilson. The effect was clearly seen by the members of the Society present.—Exhibition of models of the regular and semi-regular solids, by W. W. Taylor. Mr. Taylor exhibited and explained the construction of a large number of solids, the star solids having very various forms.—Partial differential equations of the second order, involving three independent variables and possessing an intermediary integral, by Prof. Forsyth. The author discussed the theory of these equations and developed it to the same extent as the corresponding theory in the case of two variables had already been developed. In particular, he dealt with the equations which are the extension of the Monge-Boole form; and he obtained a class of equations which is the generalisation of the class discovered by Goursat: they possess an intermediary integral, though not of the general functional character appropriate to the Monge-Boole equation.—The harmonic expression of the daily variation of solar radiation, and the annual variation of its coefficients, by Mr. R. Hargreaves.—On the fifth book of Euclid's elements, by Dr. M. J. M. Hill.—Electrification of newly prepared gases, by Mr. J. S. Townsend. This paper contained an account of experiments which were applied to find the charge on the individual carriers of the electricity in charged gases, and also the velocity of the carrier when acted on by an electric force. The results of experiments on diffusion show that the charge will not diffuse through porous earthenware with the gas.—On a chemical effect produced by the impact of kathode rays, by Prof. J. J. Thomson and Mr. Skinner. Aluminium is rapidly evaporated from the kathode by an electric discharge in a highly exhausted vacuum tube in which air has been replaced by mercury vapour. The metal is condensed over the walls of the tube in the form of a bright mirror. An iron kathode gives a similar mirror in a mercury vapour discharge tube. When the aluminium coating is dissolved off the wall of the bulb by hydrochloric acid a gelatinous membrane remains which gives the reactions of silica. When potassium vapour is used the glass opposite the aluminium kathode is roughened. In parts sheltered by screens from the discharge the glass is not attacked. In potassium vapour the aluminium kathode is not evaporated to any marked degree. Opposite the kathode both in the mercury vapour and potassium vapour bulbs a dark annular stain of the shape of the kathode is formed. This stain resists the action of strong hot hydrochloric acid, nitric acid, aqua regia and potash solution. The action of hydrochloric acid removed it apparently by dissolving the glass. The tests indicate carbon, but the quantity of the stain is too small to make certain. The stain is also formed on screens of mica, quartz and calcite. Monatomic gases appear to permit the evaporation of aluminium, as Prof. Callendar has observed its evaporation in an argon vacuum tube.—On the effect of zinc and other metals on a photographic plate, by Prof. J. J. Thomson. In the course of a discussion at the Cavendish Physical Society on Dr. Russell's paper on the photographic effect produced by certain metals, Sir George Stokes suggested that possibly light might be thrown on the question as to whether these effects were due to radiation or to the vapour of the metals, if photographs were taken with a stream of air flowing between the metal and the photographic plate. In consequence of this suggestion a series of the photographs made by zinc and amalgamated zinc (1) with nothing but air between the zinc and the photographic plate, (2) when the zinc was covered with a film of celluloid, were taken both with and without an air blast. The photographs with the air blast were found in both cases to be distorted, which is in favour of the view that the effects on the photographic plates are due to the vapour of the metals.

MANCHESTER.

Literary and Philosophical Society, November 16.—Mr. J. Cosmo Melvill, President, in the chair.—Mr. Joyce showed a small pocket form of voltmeter of the permanent magnet class. It is contained in an old-fashioned watch case, the first example having been made by Mr. Joyce in 1885. The present instrument is wound to read to three volts, a reading much required in a cell tester for users of secondary batteries. In order to make the case quite smooth outside, the terminals are formed of two spring chucks contained inside the instrument and capable of gripping any wire from No. 24 to No. 18 B.W.G. Instruments have been made reading to 120 volts total.—The President communicated a paper by Mr. Peter Cameron, entitled "Descriptions of two new species of *Mutilla* from South Africa," the specimens being exhibited at the meeting.

PARIS.

Academy of Sciences, November 22.—M. A. Chatin in the chair.—On the Leonids, by M. J. Janssen. No special increase above the ordinary number of shooting stars was observed on the night of November 13–14, either in Paris or at San Francisco. It is suggested that next year arrangements should be made to secure, if possible, the spectra of some of these bodies.—On the automatic registration of the calorific intensity of the solar radiation, by M. A. Crova. Two self-registering instruments of the pattern previously described when placed side by side yield identical curves. Owing to the delicacy of adjustment, however, this class of instrument is only suitable for an observatory, the necessity for a more portable type leading to the construction of the instrument described in the present paper. This consists essentially of a thermo-electric couple, in circuit with a self registering aperiodic galvanometer. The practical trials of this actinometer at the Meudon Observatory, and on Mount Blanc, have been quite satisfactory.—On certain questions relating to the problem of Dirichlet, by M. A. Liapounoff.—On completely orthogonal systems in any space whatever, by M. G. Ricci.—On the theory of infinite transformation groups, and the integration of partial differential equations, by M. Jules Beudon.—On a method of registering photographically thermal radiations, by M.

A. Guérhard. Five illustrations from photographs accompany this paper, by which it is shown that substances whose temperature differs but slightly from that of the atmosphere may be made to produce effects upon a sensitised plate. These results show that the phenomena described by some authors as photographs of human effluvia are simply due to the temperature of the hand.—Influence of temperature upon the rotatory power of liquids, by M. Ph. A. Guye and Mdlle. E. Aston. Primary amyl alcohol appears to offer an exception to the rules formulated in previous papers for the relation between rotatory power and temperature, inasmuch as in the neighbourhood of the boiling point the specific rotation undergoes a sudden increase. An explanation of this was sought in the observations of Ramsay and Shields, which showed that liquid amyl alcohol is composed of complex molecules, breaking up into single molecules on vaporisation. To confirm this, observations were made of the rotation of amyl alcohol in water and in benzene solutions, cryoscopic determinations showing that the alcohol was not associated in water, but polymerised in benzene. The results were exactly in accordance with the above hypothesis.—On the rotatory power of polymerised bodies, compared with their monomers, by M. Berthelot. Remarks on the preceding paper.—On chlorocyanamide, by M. Paul Lemoult. A thermochemical paper.—Contribution to the study of nitrification in soils, by M. Th. Schlœsing, jun.—Influence of oxygen and other substances upon the formation of chlorophyll, by M. W. Palladine. By placing etiolated leaves containing practically no carbohydrates on the surface of certain solutions and exposing to light, it was found that saccharose, raffinose, glucose, fructose, maltose, glycerine, galactose, lactose and dextrine distinctly favour the production of chlorophyll; inuline and tyrosine are without sensible action; whilst other substances, such as mannite, dulcite, urea, alcohol, retard or even prevent completely the formation of the colouring matter.—On certain improvements to the Bourdon anemometer, by M. R. Mailhat.—An apparatus to determine in a precise manner, by means of the X-Rays, the position of projectiles in the cranium, by MM. Remy and Contremoulins. The skull is photographed successively by two Crookes' tubes placed in different positions, and the trace thus obtained projected on to the head by cranial compasses.—Remarks by M. Marey on this apparatus. In eleven preliminary experiments on the dead subject, the exact position of bullets, and even of splinters of bone, was determined with perfect accuracy. Two cases on the living subject were also carried out with complete success.

DIARY OF SOCIETIES.

THURSDAY, December 2.

Linnean Society, at 8.—On the Anatomy of *Caudina coriacea*: Prof Arthur Dendy.—On some Desmids from the United States: W. West and G. S. West.——Exhibitions: Specimens of Galls of *Cecidomya*: Prof. J. B. Farmer.—An Egg of *Echidna*: Martin Woodward.

Chemical Society, at 8.—Ballot for the Election of Fellows.—On Collie's Space-Formula for Benzene: Dr. F. E. Matthews.

Camera Club, at 8.15.—Photomicrography: Dr. Spitta.

FRIDAY, December 3.

Institution of Civil Engineers, at 8.—Permanent Way: its Construction and Relaying: Grote Stirling.

Geologists' Association, at 8.—Notes on the Geology of the Stort Valley (Herts and Essex) with Special Reference to the Plateau Gravels: Rev. Dr. A. Irving.

MONDAY, December 6.

Society of Arts, at 8.—Gutta-Percha: Dr. Eugene F. A. Obach.

Imperial Institute, at 8.30.—The Mineral Resources of British Columbia and the Yukon: A. J. McMillan.

Society of Chemical Industry, at 8.—The Sulman-Teed Process of Gold Extraction: H. L. Sulman and Dr. F. L. Teed.

Victoria Institute, at 4.30.—Paper by Rev. H. Lansdell.

TUESDAY, December 7.

Anthropological Institute, at 8.30.

Röntgen Society, at 8.30—Adjustable X-Ray-Tubes: A. A. Campbell Swinton.

Royal Victoria Hall, at 8.30.—Klondike: Dr. T. K. Rose.

Institution of Civil Engineers, at 8.—Paper to be further discussed: On the Law of Condensation of Steam: Hugh L. Callendar, F.R.S., and John T. Nicolson.

WEDNESDAY, December 8.

Society of Arts, at 8.—The Mining and Metallurgical Industries of Sweden as shown at the Stockholm Exhibition of 1897: Bennett H. Brough.

THURSDAY, December 9.

Royal Society, at 4.30.—The following Papers will *probably* be read:—On the Densities of Carbonic Oxide, Carbonic Anhydride, and Nitrous Oxide: Lord Rayleigh, F.R.S.—On the Application of Harmonic Analysis to the Dynamical Theory of the Tides. Part II. On the General Integration of Laplace's Dynamical Equations: S. S. Hough.—A Note on some Further Determinations of the Dielectric Constants of Organic Bodies and Electrolytes at Very Low Temperatures: Prof. Dewar, F.R.S., and Prof. Fleming, F.R.S.—On Methods of making Magnets independent of Changes of Temperature, and some Experiments upon Negative Temperature Co-efficients in Magnets: J. R. Ashworth.—The Electric Conductivity of Nitric Acid: V. H. Veley, F.R.S., and J. J. Manley.—On the Calculation of the Co-efficient of Mutual Induction of a Circle and a Coaxial Helix, and of the Electromagnetic Force between a Helix and a Coaxial Circular Cylindrical Sheet: Prof. J. V. Jones. F.R.S.—On the Refractivities of Air, Nitrogen, Argon, Hydrogen, and Helium: Prof. W. Ramsay, F.R.S., and M. W. Travers.

Mathematical Society, at 8.—The Construction of the Straight Line joining Two Given Points: Prof. W. Burnside, F.R.S.—A Theorem concerning the Special Systems of Point Groups on a Particular Type of Base Curve: Miss F. Hardcastle.—A General Type of Vortex Motion; R. Hargreaves.

Institution of Electrical Engineers, at 8.—Annual General Meeting.

FRIDAY, December 10.

Royal Astronomical Society, at 8.

Malacological Society, at 8.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

Books.—Manuel d'Analyse Chimique: Dr. E. Fleurent (Paris, Carré).—Psychologie als Erfahrungswissenschaft: H. Cornelius (Leipzig, Teubner).—Handbuch der Photographie: Prof. H. W. Vogel. iii. Theil. Die Photographische Praxis, Abtg. 1 (Berlin, Schmidt).—The Dawn of Civilization: Egypt and Chaldæa: G. Maspero, translated by M. L. McClure, 3rd edition (S.P.C.K.).—A Handbook to the Geology of Cambridgeshire: F. R. C. Reed (Cambridge University Press).—Petrology for Students: A. Harker, 2nd edition (Cambridge University Press).—The Journals of Walter White, Assistant Secretary of the Royal Society (Chapman).—Modern Architecture: H. H. Statham (Chapman).—Annuario de Estado do Rio Grande do Sul, 1898: G. A. de Azambuja (Porto Alegre).

Pamphlets.—Aims and Methods of Education: Prof. P. Smith: Birmingham, Cornish).—Rousdon Observatory, Devon, Meteorological Observations, 1896 (Rousdon).—Some North American Coniferæ: E. S. Bastin and H. Trimble (Philadelphia).

Serials.—Rousdon Observatory, Variable Star Notes, No. 2 (Rousdon)—Proceedings, and Transactions of the Queensland Branch of the Royal Geographical Society of Australasia, Session 1896–97 (Brisbane).—English Illustrated Magazine, Christmas (198 Strand).—Longman's Magazine, December (Longmans).—Memoirs of the Peabody Museum, Harvard University. Vol. 1, Nos. 1–3 (Cambridge, Mass.).—Natural Science, December (Dent).—Humanitarian, December (Hutchinson).—Zeitschrift für Wissenschaftliche Zoologie, lxiii. Band, 2 Heft (Leipzig, Engelmann).—Good Words. December and Christmas (Isbister).—Sunday Magazine, December and Christmas (Isbister).—National Geographic Magazine, November (Washington).—Terrestrial Magnetism, September (Cincinnati).

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